Listing of the Claims

In the Claims:

Claims 1-33 (Previously Canceled)

34. (Previously Presented) A method for detecting a feature using an imaging system, where the feature is part of an object and the feature can be labeled, comprising the steps of:

(a) labeling the feature such that a plurality of different optical signaling components become bound to said feature, probes suitable for so labeling the feature comprising:

(i) a single type of probe comprising a binding element that selectively binds to at least a portion of the feature, and a plurality of optical signaling components, at least two of which are different, thereby enabling the plurality of different optical signaling components to be bound to said feature; and

(ii) two different types of probes, each of which comprises a binding element that selectively binds to at least a portion of the feature, and at least one optical signaling component, such that the optical signaling components of the two different types of probes are not identical, thereby enabling the plurality of different optical signaling components to be bound to said feature;

(b) collecting light from said object along a collection path, the light that is collected comprising light corresponding to each of the plurality of different optical signaling components that has been simultaneously collected;

(c) dispersing the light that is traveling along the collection path into a plurality of light beams, as a function of a discriminable characteristic enabling the different optical signaling components to be distinguished;

(d) focusing each of the plurality of light beams onto a single detector having sufficient pixels to enable a plurality of images to be simultaneously detected, to produce a respective image corresponding to that light beam, thereby simultaneously generating a plurality of images, locations of probes bound to said feature included in the plurality of images being optically discriminated, such that each of the plurality of images are generated on the single detector, wherein an image of each different optical signaling component bound to a single feature is dispersed to a different portion of the detector, such that different optical signaling components are not coincident on the detector, regardless of their relative position on the object;

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(e) detecting the plurality of images to produce a signal indicative of each optical signaling component, such that a different signal is produced for each of the plurality of images; and

(f) analyzing each different signal produced for each of the plurality of images to determine if indicative spectral signals produced by the plurality of different optical signaling components are present, thereby establishing that the feature is part of the object.

35. (Previously Presented) The method of Claim 34, wherein the step of labeling the feature comprises the step of exposing said object to the single type of probe, thereby binding said plurality of optical signaling components of the single type of probe to said feature.

36. (Previously Canceled)

37. (Previously Presented) The method of Claim 34, wherein the step of analyzing each different signal produced for each of the plurality of images comprises the step of determining if an intensity of a waveband of light indicative of said plurality of different optical signaling components is present in that image.

38. (Previously Presented) The method of Claim 34, wherein said object comprises a biological cell, and said feature comprises a cellular component.

39. (Previously Presented) The method of Claim 34, wherein the step of analyzing each different signal produced for each of the plurality of images comprises the step of determining if a multiplex of a spectral signature for each of the plurality of different optical signaling components is present in that image, such that the following spectral signatures can be differentiated, where A corresponds to a first optical signaling component, and B corresponds to a second optical signal component, where light defining all such spectral signatures has been simultaneously collected:

(a) a spectral signature comprising A-A-A-B;

(b) a spectral signature comprising A-A-B-B; and

(c) a spectral signature comprising A-B-B-B.

40. (Previously Presented) The method of Claim 34, wherein the step of labeling the feature comprises the step of exposing said object to the two different types of probes, thereby binding the plurality of different optical signaling components of the two different types of probes to said feature.

41. (Previously Canceled)

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42. (Previously Presented) A method for probing an object with probes to detect if any of a plurality of specific features are part of the object, using an imaging system, wherein such probes can be attached to each such feature, the method comprising the steps of:

(a) for each specific feature to be detected, providing each type of probe required to uniquely label each specific feature that is part of the object, types of probes suitable for so labeling each specific feature comprising:

(i) one type of probe including a binding element that selectively binds to the feature, and a plurality of optical signaling components, at least two of which are different, thereby enabling the plurality of different optical signaling components to be bound to said feature; and

(ii) two different types of probes, each of which includes a binding element that selectively binds to at least a portion of the feature, and at least one optical signaling component, such that the optical signaling components of the two different types of probes are not identical, thereby enabling the plurality of different optical signaling components to be bound to said feature;

(b) exposing said object to each type of probe required to uniquely label each specific feature that is part of the object;

(c) collecting light from said object along a collection path, the light that is collected comprising light corresponding to each optical signaling component used to label the plurality of specific features that are part of the object, such light having been simultaneously collected;

(d) dispersing the light that is traveling along the collection path into a plurality of light beams, as a function of a wavelength, such that each different light beam corresponds to a different wavelength of light;

(e) focusing each of the plurality of light beams corresponding to a different wavelength onto a different portion of a single detector, to produce a respective image corresponding to that wavelength, thereby simultaneously generating a plurality of images on the single detector, locations of probes bound to said feature included in the plurality of images being optically discriminated, such that each different one of the plurality of light beams is dispersed onto a different portion of the detector, so each pixel of each respective image having the same wavelength is received at the same portion of the detector, while being spaced apart from each pixel of each respective image having a different

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wavelength, such that pixels of different wavelengths corresponding to an identical portion of the object are not coincident;

(f) detecting the plurality of images to produce a signal indicative of each optical signaling component present in the plurality of images and used to uniquely label each specific feature that is part of the object, such that a different signal is produced for each of the plurality of images; and

(g) analyzing the signals produced for each of the plurality of images to determine which specific feature is part of the object.

43. (Previously Presented) The method of Claim 42, wherein at least one specific feature to be detected is labeled with the one type of probe including the plurality of optical signaling components.

44. (Previously Presented) The method of Claim 42, wherein said object comprises a biological cell, and each feature comprises a cellular component.

45. (Previously Canceled)

46. (Previously Presented) The method of Claim 42, wherein at least one specific feature to be detected is labeled with the two different types of probes including the optical signaling components that are not identical.

47. (Previously Canceled)

48. (Previously Canceled)

49. (Previously Presented) The method of Claim 42, wherein each optical signaling component comprises a fluorescent dye, further comprising the step of directing sufficient energy toward said object, such that the fluorescent dye is excited to emit a fluorescent light comprising a uniquely discriminable characteristic of the optical signaling component.

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50. (Previously Presented) The method of Claim 42, wherein the step of analyzing each different signal produced for each of the plurality of images comprises the step of determining if a multiplex of a spectral signature for each of the plurality of different optical signaling components is present in that image, such that the following spectral signatures can be differentiated, where A corresponds to a first optical signaling component, and B corresponds to a second optical signal component, where light defining all such spectral signatures has been simultaneously collected:

(a) a spectral signature comprising A-A-A-B;

(b) a spectral signature comprising A-A-B-B; and

(c) a spectral signature comprising A-B-B-B.

51. (Previously Presented) The method of Claim 42, wherein at least one specific feature is uniquely discriminable based on a spectral composition of light from a plurality of optical signaling components bound to that at least one specific feature.

52. (Previously Canceled)

53. (Previously Canceled)

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54. (Previously Presented) A method for detecting a feature using an imaging system, where the feature is part of an object and the feature can be uniquely labeled, comprising the steps of:

(a) labeling the feature such that a plurality of different optical signaling components become bound to said feature, types of probes suitable for so labeling each specific feature comprising:

(i) a single type of probe including a binding element that selectively binds to the feature, and a plurality of optical signaling components, at least two of which are different, thereby enabling the plurality of different optical signaling components to be bound to said feature; and

(ii) two different types of probes, each of which includes a binding element that selectively binds to at least a portion of the feature, and at least one optical signaling component, such that the optical signaling components of the two different types of probes are not identical, thereby enabling the plurality of different optical signaling components to be bound to said feature;

(b) collecting light from said object along a collection path, while there is relative motion between the object and an apparatus employed to collect the light, the light that is collected comprising light corresponding to each of the plurality of different optical signaling components that has been simultaneously collected, such that the collection path is substantially orthogonal to an axis of the relative motion, a field angle in object space along the collection path being sufficiently small so as to enable light collected from the object to be spectrally dispersed onto a single detector;

(c) spectrally dispersing the light that is traveling along the collection path into a plurality of light beams, as a function of a wavelength;

(d) focusing each of the plurality of light beams to produce a respective image corresponding to that light beam on the single detector, thereby simultaneously generating a plurality of spectrally distinguishable images on the single detector each different spectral image being dispersed onto a different portion of the detector, such that pixels of different spectral images corresponding to an identical portion of the object are not coincident;

(e) detecting the plurality of images to produce a signal indicative of each optical signaling component, such that a different signal is produced for each of the plurality of images; and

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(f) analyzing each different signal to determine if a spectral component due to each optical signaling component bound to said feature is present in the image, thereby establishing that said feature is part of the object.

55. (Previously Canceled)

56. (Previously Presented) A method for detecting a feature using an imaging system, where the feature is part of an object and the feature can be uniquely labeled, comprising the steps of:

(a) labeling the feature such that a plurality of different optical signaling components become bound to said feature;

(b) collecting light from said object along a collection path, while there is relative motion between the object and an apparatus employed to collect the light, the light that is collected comprising light corresponding to each of the plurality of different optical signaling components and being simultaneously collected;

(c) spectrally dispersing the light that is traveling along the collection path into a plurality of light beams such that light from different optical signaling components is included in different ones of plurality of light beams;

(d) focusing each of the plurality of light beams onto a different portion of a single detector to produce a respective image corresponding to that light beam, thereby simultaneously generating a plurality of spectral images on the single detector, such that each different spectral image is dispersed onto a different portion of the detector, such that pixels of different spectral images corresponding to an identical portion of the object are not coincident;

(e) detecting the plurality of images to produce a signal indicative of each optical signaling component, such that a different signal is produced for each of the plurality of images; and

(f) analyzing each different signal produced for each of the plurality of images to determine if indicative spectral signals produced by the plurality of different optical signaling components are present, thereby establishing that the feature is part of the object.

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57. (Previously Presented) The method of Claim 56, wherein the step of labeling the feature such that a plurality of different optical signaling components become bound to said feature comprises the step of exposing the object to a single type of probe comprising a binding element that selectively binds to at least a portion of the feature, and a plurality of optical signaling components, at least two of which are different, thereby enabling the plurality of different optical signaling components to be bound to said feature.

58. (Previously Presented) The method of Claim 56, wherein the step of labeling the feature such that a plurality of different optical signaling components become bound to said feature comprises the step of exposing the object to two different types of probes, each of which comprises a binding element that selectively binds to at least a portion of the feature, and at least one optical signaling component, such that the optical signaling components of the two different types of probes are not identical, thereby enabling the plurality of different optical signaling components to be bound to said feature.

59. (Previously Canceled)

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60. (Previously Presented) A method for probing an object with probes to detect if any of a plurality of specific features are part of the object, using an imaging system, wherein such probes can be attached to each such specific feature, the method comprising the steps of:

(a) for each specific feature to be detected, providing each type of probe required to uniquely label each specific feature that is part of the object, types of probes suitable for so labeling each specific feature comprising:

(i) plural signaling probes, each plural signaling probe comprising a binding element that selectively binds to at least a portion of said specific feature, and a plurality of optical signaling components, at least two of which are different, thereby enabling a plurality of different optical signaling components to be bound to said specific feature if said specific feature is part of the object; and

(ii) mono signaling probes, each mono signaling probe comprising a binding element that selectively binds to at least a portion of said specific feature, and one optical signaling component, such that two different types of mono signaling probes, each different type including a different optical signaling component, are needed to enable a plurality of different optical signaling components to be bound to said specific feature if said specific feature is part of the object;

(b) exposing said object to each type of probe required to uniquely label each specific feature that is part of the object;

(c) collecting light from said object along a collection path, the light that is collected comprising light corresponding to each optical signaling component used to label the plurality of specific features that are part of the object, such light having been simultaneously collected;

(d) spectrally dispersing the light that is traveling along the collection path into a plurality of light beams as a function of a plurality of different discriminable characteristics of the light;

(e) focusing each of the plurality of light beams onto a different portion of a single detector, to produce a respective image corresponding to that light beam, thereby simultaneously generating a plurality of spectral images on the single detector, locations of probes bound to said feature included in the plurality of images being optically discriminated, such that each different spectral image is dispersed onto a different portion of the detector, such that pixels of different spectral images corresponding to an identical portion of the object are not coincident;

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(f) detecting the plurality of images to produce a signal indicative of each optical signaling component present in the plurality of images and used to uniquely label each specific feature that is part of the object, such that a different signal is produced for each of the plurality of images; and

(g) analyzing the signals produced for each of the plurality of images to determine which specific feature is part of the object.

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61. (Previously Presented) A method for detecting a feature using an imaging system, where the feature is part of an object and the feature can be uniquely labeled, comprising the steps of:

(a) labeling the feature such that a plurality of different optical signaling components become bound to said feature, the feature being labeled using either:

(i) one type of probe including a binding element that selectively binds to the feature, and a plurality of optical signaling components, at least two of which are different, thereby enabling the plurality of different optical signaling components to be bound to said feature; or

(ii) two different types of probes, each of which includes a binding element that selectively binds to at least a portion of the feature, and at least one optical signaling component, such that the optical signaling components of the two different types of probes are not identical, thereby enabling the plurality of different optical signaling components to be bound to said feature;

(b) collecting light from said object along a collection path, while there is relative motion between the object and an apparatus employed to collect the light, the light that is collected comprising light corresponding to each of the plurality of different optical signaling components that has been simultaneously collected;

(c) spectrally dispersing the light that is traveling along the collection path into a plurality of light beams as a function of a plurality of different discriminable characteristics of the light;

(d) focusing each of the plurality of light beams onto a different portion of ~~a~~ the single detector to produce a respective image corresponding to that light beam, thereby simultaneously generating a plurality of spectral images on the single detector, such that each different spectral image is dispersed onto a different portion of the detector, such that pixels of different spectral images corresponding to an identical portion of the object are not coincident;

(e) detecting the plurality of images to produce a signal indicative of each optical signaling component, such that a different signal is produced for each of the plurality of images; and

(f) analyzing each different signal to determine if a spectral component due to each optical signaling component bound to said feature is present in the image, thereby establishing that said feature is part of the object.

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